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ABSTRACT

Factor analysis was used to summarize the interrelationships between a large and varied collection of measures. Data for 500 third grade students assigned to either an experimental or a comparison condition were obtained. The data covered scores for the first 28 items of the Student Affective Behavior Checklist, (2) 9 nonmathematics subtests of the Iowa Tests of Basic Skills-Form 4, and (3) 11 subtests of the Botel Reading Inventory-Form B. Sex, race, IQ (Otis Lennon Mental Ability Test Form K, Level 1), number of siblings, number of school absences, instructional group level, and father's occupational status were also determined. A total of 56 variables were tested. A varimax rotation was performed on the 11 factors extracted using a principal components extraction measure. The results indicate that the groups of variables entering the analysis were generally more related among themselves than to members of other groups. More intensive efforts to determine the nature of and interrelationships between behavioral, achievement, and socioeconomic variables with methodological refinement is recommended. (Author/JS)

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The Factor Structure of Certain Behavioral, Academic Achievement and Socioeconomic Measures

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Scores for the following were obtained for 500 third grade students:

The first 28 items on the Student Affective Behavior Checklist* (Roberson, 1970).

Scores on the nine nonmathematics subtests (V, R, L-1 to L-4, W-1 to W-3) of the Iowa Tests of Basic Skills - Form 4 (ITBS), May administration

Scores on the 11 subtests of the Botel Reading Inventory - Form B (BRI), May administration

Experimental condition: Experimental or Comparison (included because an experiment was in progress)

Sex

Race

IQ: Otis Lennon Mental Ability Test - Form K, Level 1 (OLMAT), February administration

Number of siblings

Number of absences from school

Instructional Group Level: Rated from one to six according to teacher's impressions with 1 as highest and 6 as lowest.

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*The final eight items of the SABC are not scalable for use in this analysis. To provide a meaningful analysis of their relationships to other variables of the study is beyond the immediate resources of the project.

Father's occupational status: Three levels--professional, skilled and unskilled. (Category 1 included those whose occupation might generally be classified as "professional." For the most part, these occupations were ones which required at least a bachelor's degree for admission. Category 2, which may be referred to as "skilled," included occupations requiring substantial training and ability for success but not at the level of the first category. Category 3, "unskilled," included those jobs which required little preparation or training, were relatively low-paying and offered little security.

A total of 56 variables is represented.

The question at hand is how to summarize the interrelationships between such a large and varied collection of measures. The statistical procedure, factor analysis, serves this purpose. It displays groups or clusters of variables which tend to be interrelated and shows the strength of the relationship of each variable to a pseudo-variable, or factor, representative of the group as a whole. Unlike other methods, such as cluster analysis, factor analysis displays the situation in which a variable is related to more than one group. Consider the variable, race, in the above list. Each student's vector of scores contained a one for black or a two for white. The race to which children belong might have been expected to be related to behaviors or academic outcomes. If so, the "scores" for race would be correlated with the factor representing the behaviors or academic outcomes.

In more technical terms, the intercorrelation matrix for the 56 variables of this study entered a principal components extraction (unities placed in the diagonal) to the point at which eigenvalues of less than unity were encountered. For the eleven factors thus extracted, a varimax rotation was performed. However, the results are informative only to a very limited extent, and for this reason the rotated factor matrix is not displayed. The eleven factors extracted, which account for 69 percent of the total variance, may be described as follows:

Factor 1--Academic achievement as measured by ITBS. All ITBS variables loaded heavily on this factor along with IQ and Instructional Group Level. Some of the BRI variables also loaded on this factor substantially, specifically Instructional Level, Potential Level, Single Vowels, Vowel Combinations and Nonsense Words.

Factor 2--Reading achievement as measured by the BRI. All BRI variables loaded heavily on this factor.

Factor 3--Behavior as defined along an agressive-passive continuum. Items 5, 6, 7, 10 through 13, 15, and 19 through 28 of the SABC load heavily on this factor.

Factor 4--Behavior related to conformity, leadership, and responsibility. Items 4, 7, 14 through 17 of the SABC loaded heavily on this factor.

Factor 5--Behavior related to classroom participation through speaking in answer to questions, etc. Items 1, 2, 3 and 6 of the SABC load heavily on this factor.

Factor 6--Behavior related bringing materials to school or perceived popularity of the student. Items 8, 9 and 18 of the SABC loaded heavily on this factor.

Factor 7--Behavior defined in terms of respect for authority. Items 10, 18 and 24 of the SABC loaded heavily on this factor.

Factor 8--Siblings, race and father's occupation. The tendency for black children to have more siblings and fathers of lower occupational status resulted in this factor.

Factor 9--Experimental Condition. No other variables loaded on this factor to an extent that might be considered significant.

Factor 10--Number of absences. Items 28 of the SABC (which concerns absences) also loaded on this factor.

Factor 11--Sex. The variable Nonsense Words from BRI loaded heavily on this variable. The "superiority" of girls is reversed for Nonsense Words of the BRI, and the factor analysis shows that success on this subtest is substantially related to being a boy.

It had been hoped that the variables race, father's occupation, siblings, sex and experimental condition might display loading patterns which would permit at least tentative conclusions not previously apparent. Further, it had been hoped the behavioral variables might be related to academic achievement in some ways which might define and orient innovative programs.

A major reason for the disappointing nature of this latter outcome may be that the behavior scores represent teachers' impressions or interpretations of behavior rather than scores based on some more objective criterion. Certain subtle evidences of teacher fallability may be observed. For example, the SABC item regarding leadership qualities (No. 15) loads positively on two factors. One of these has positive loadings from items describing unpleasant behavior such as quarrelsomeness and disrespect for authority. The other has positive loadings from items describing courtesy and acceptance of group decisions. This inconsistency illustrates the weakness of using checklists

when raters are relatively untrained and may have some emotional involvement with the subjects they are rating. Thus, the need may be for additional scores based on some more objective criterion instead of scores representing only teachers' impressions or interpretations of behavior.

In summary, it may be said that the groups of variables entering this analysis were for the most part more related among themselves than to members of other groups. This finding does not detract from the importance of the interrelationships between behavioral, achievement and socioeconomic variables, but suggests the need for methodological refinements in future studies.

More intensive efforts to determine the nature of and interrelationships between behavioral, achievement, and socioeconomic variables with methodological refinement is recommended.

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